

# TOLEDO TESTING LABORATORY

TOLEDO, OHIO 43624

## CERTIFICATE OF TEST

September 12, 1968

US EPA RECORDS CENTER REGION 5



George R. Kunkle  
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MANHATTAN BOULEVARD HYDROLOGICAL  
SURVEY, TOLEDO, OHIO

Laboratory No. 363863

### REPORT OF

### SUBSURFACE GROUND INVESTIGATION AND LABORATORY TEST RESULTS

On August 12 and 25, 1968, this laboratory made a subsurface ground investigation on the above noted site in order to determine the various soil layers underlying the area and to collect samples for visual examination and laboratory testing.

The field exploration consisted of five (5) test borings (Nos. 1, 1A, 2, 3, and 4) and were made by means of power rig and soil sampler(s) (Shelby and Housel tubes, and split spoon).

From this exploration one (1) Shelby tube, one (1) Housel tube, and assorted jar samples (submitted directly to the client) were collected - on which two (2) each of the following \*tests were performed:

Natural moisture content determinations,  
Dry density determinations,  
Void Ratio determinations,  
Porosity determinations,  
Mechanical Analysis (Grading and Hydrometer),  
Atterberg Limits Test sets (L.L., P.L., and P.I.),  
Soil group classifications,  
Coefficient of permeability determinations.

(\*Tests performed on the Shelby Tube and Housel Tube samples).

The tests were carried out in accordance with the prescribed procedure of the American Society for Testing and Materials.

Logs and test results are as follows:

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### LOG OF BORINGS

TYPE OF RIG: Mobile

METHOD OF OVERBURDEN SAMPLING: Shelby and Housel tube and Split spoon

LOCATIONS: Staked by Client

### TEST BORING NO. 1

TOTAL OVERBURDEN DRILLED: 40'0"

### LOG

DEPTH	DESCRIPTION OF MATERIAL
0'0" - 2'0"	Crushed brick, wood, rubble, etc.
2'0" - 13'0"	Brown silty clay, trace of sand and gravel.
13'0" - 40'0"	Grey sandy silt with clay, trace of gravel, medium to stiff, moist. Sample No. 1 (Shelby) taken at 38'0" to 39'0"
	No water encountered while drilling.

NOTE: Jar samples taken every five foot given to client.

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TEST BORING NO. 2

TOTAL OVERBURDEN DRILLED: 101'0"

LOG

DEPTH	DESCRIPTION OF MATERIAL
0'0" - 11'0"	Fill, crushed brick, wood, rubble, etc.
11'0" - 14'0"	Dark brown silty clay, little peat, little to some sand, trace of gravel.
14'0" - 101'0"	Grey very silty clay, little sand, trace of gravel, medium to stiff, moist. Sample No. 1 (House 1) taken at 30'0" to 39'0"
	No water encountered while drilling.
	Boring No. 1A - 20'0" - No samples
	Boring No. 3 - 10'0" - 1 Split spoon sample (submitted directly to client)
	Boring No. 4 - 22'0" - No samples

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TABLE NO. 1

MECHANICAL ANALYSIS (SIEVING AND HYDROMETER) AND  
COMPOSITION OF SOIL

Bor- Test Num- ber	Sam- ple Num- ber	Depth (ft.-in.)	<u>SIEVING</u> <u>PERCENT PASSING SIEVE NUMBERS AND SIZES</u>					<u>HYDROMETER</u> <u>Combined Percentage of Soil Particles Finer Than 0.005 mm</u>		Retained on No.10 Sieve	Passing No.10 Sieve	Passing No.200 Sieve	FINES SILT (%) CLAY (%)	
			No. 4	No.10	No.40	No.200		GRAVEL (%)						
			3/8"											
1	1	1	38'0"-39'0"	100.00	97.60	92.52	83.27	63.10	39.06	7.48	29.42	24.02	39.08	63.10
2	2	1	38'0"-39'6"	100.00	99.40	97.67	93.37	84.00	56.75	2.33	13.67	27.25	56.75	84.00

TABLE NO. 2

ATTERBERG LIMITS, (L.L., P.L., and P.I.), GROUP DESIGNATION AND GROUP INDEX,  
according to classification by OHIO DEPARTMENT OF HIGHWAYS

Test Number	Boring Number	Sample Number	Depth (ft.-in.)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index P.I.	Group Designation and Group Index according to classifica- tion by OHIO DEPARTMENT OF HIGHWAYS
1	1	1	38'0"-39'0"	20.3	13.1	7.2	A-4a (1.0) Grey sandy silt with clay, trace of gravel.
2	2	1	38'0"-39'6"	33.1	17.0	16.1	A-6b (10.5) Grey very silty clay, little sand, trace of gravel.

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TABLE NO. 3

NATURAL MOISTURE CONTENT, DRY DENSITY, VOID RATIO, POROSITY, AND  
COEFFICIENT OF PERMEABILITY

Test Num- ber	Bor- ing Num- ber	Sam- ple Num- ber	Depth (ft.-in.)	Nat- ural Mois- ture Con- tent (S)	Dry Density (lb./cu.ft.)	Void Ratio	Porosity	Coefficient of Permeability (cm/sec)
1	1	1	38'0"-39'0"	10.1	124.7	0.327	0.25	$2.22 \times 10^{-5}$
2	2	1	38'0"-39'6"	16.1	115.5	0.467	0.32	$9.04 \times 10^{-6}$

NOTES:

$$(1) \text{ Void Ratio, } e = \frac{G \gamma}{\gamma_d} - 1$$

Where  $G$  = Specific Gravity  
 $\gamma$  = Unit Weight of Water  
 $\gamma_d$  = Dry Density of Sample

$$(2) \text{ Porosity, } n = \frac{e}{1+e}$$

Where  $e$  = Void Ratio

$$(3) \text{ Coefficient of Permeability, } k = \frac{2.3}{t} \frac{\log_{10} h_2 - \log_{10} h_1}{A_s^2}$$

Where  $k$  = Sample permeability  
 $t$  = Area of permeameter pipe  
 $A_s$  = Area of sample surface

$t$  = Elapsed time of test

$h_1$  = Original head

$h_2$  = Final head

\* Test performed by falling-head permeameter

Respectfully submitted,

TOLEDO TESTING LABORATORY  
LBJ-DG

Orig. & Bcc:  
ef